Pushing the Limits of Multiscale Science and Engineering

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"Imagine a world free of traditional scale-related barriers between physics, chemistry, biology, and various engineering disciplines; a world where products and processes are designed based on nature's building blocks, a world in which multiscale science and engineering will revolutionize the way engineering design and scientific discovery are conducted in the 21st century," said Jacob Fish, recently appointed as the Robert A.W. and Christine S. Carleton Professor of Civil Engineering.

Considered by many to be a pioneer in multiscale computational science and engineering, Fish has spent much of his career, first at Rensselaer Polytechnic Institute and now at Columbia Engineering, working at the forefront of this emerging discipline that bridges the gap between modeling, simulation, and design of products based on multiscale principles. His research encompasses a wide variety of science and engineering disciplines, from investigating the structural integrity of mechanical, aerospace, and civil systems, to electronic packaging, nanostructured material systems, biological systems, and energy absorption systems. He has an accomplished track record of technology transfer to industry and has worked with such companies as GE, Rolls-Royce, Lockheed Martin, Sikorsky, Ford, General Motors, Chrysler, Boeing, and Northrop Grumman.

Fish, whose research emphasizes the abundance in nature of systems that encompass interacting behaviors occurring across a range of spatial and temporal scales, believes strongly that "tomorrow's technological advances in science and engineering, including materials, nanosciences, biosciences, electronics, energy, and homeland security, cannot tolerate a partitioned view of nature." Together with his University colleagues, and in collaboration with the City College of New York and New York University, he is forming a new interdisciplinary center, Multiscale Science and Engineering Center (MSEC). MSEC, whose mission is to develop the basic science needed to revolutionize engineering practice and scientific discovery based on multiscale principles, will bring together universities in New York City, drawing upon their strengths in modeling, simulation, and experimentation across multiple spatial and temporal scales. As director of MSEC, Fish hopes to promote an ongoing research in multiscale science and engineering, develop new synergies, and pursue new funding opportunities.

"I am passionate about multiscale science and engineering," said Fish, "because I honestly believe that this field is the next frontier that will transform scientific discovery and engineering design. And I'm very excited to be able to do this at Columbia Engineering."

Fish earned his B.S in structural engineering, his M.S in structural mechanics, and his Ph.D. in theoretical and applied mechanics.

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